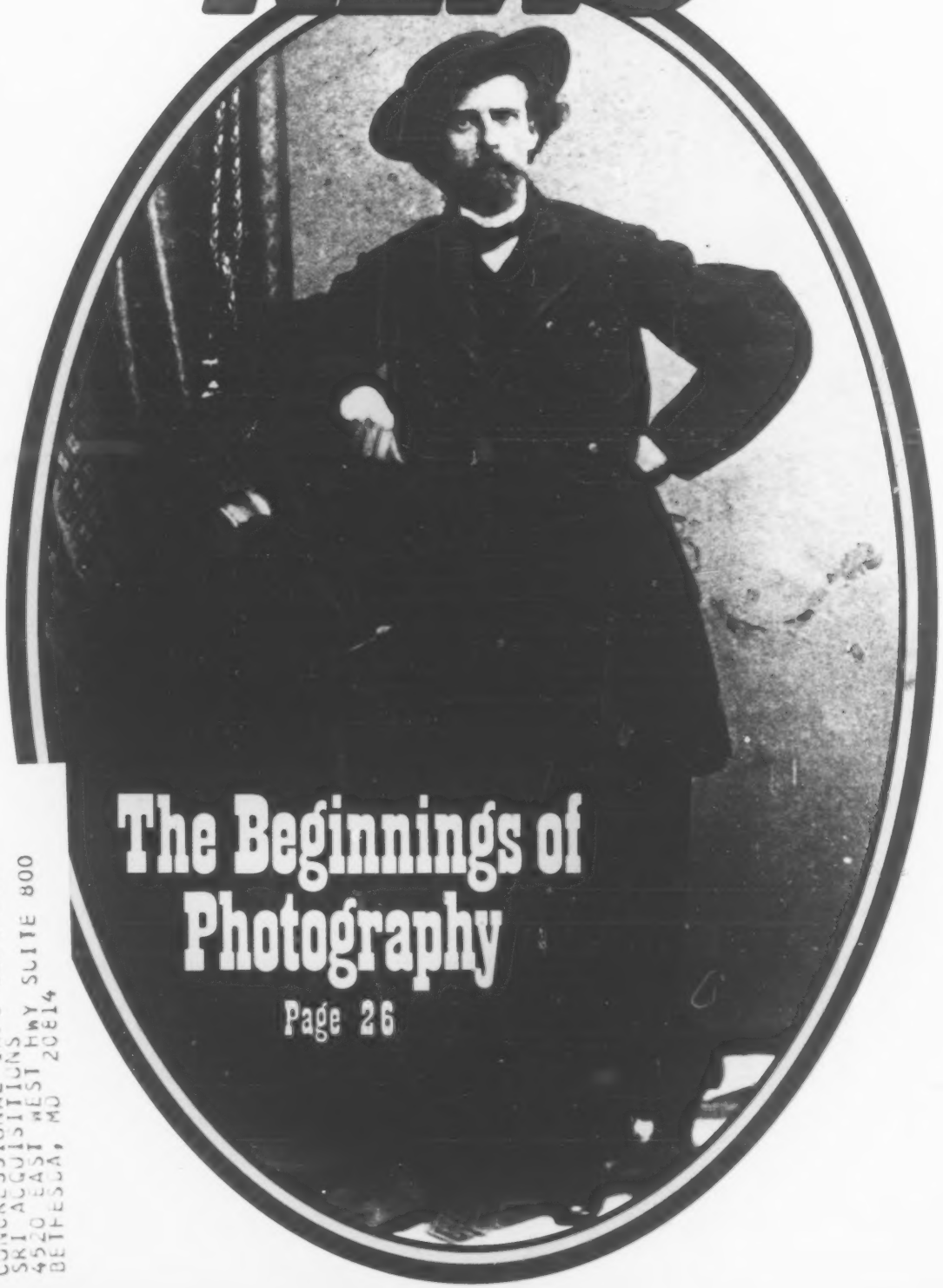
DECEMBER 18, 1989
CHEMICAL & ENGINEERING

NEWS



The Beginnings of Photography

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NEWS

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DECEMBER 18, 1989

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■ **National Research Council releases report on opportunities in biology, urges interdisciplinary cooperation.** Page 4

■ **Hawaii meeting of chemical societies from Pacific Basin nations is jointly sponsored by ACS, chemical societies of Japan and Canada.** Page 5

■ **Phillips 66 plans to rapidly replace polyethylene capacity lost in Pasadena, Tex., explosion.** Page 5

■ **Henry Helmuth Reichhold, founder of Reichhold Chemicals, dies.** Page 5

■ **French government details long-awaited restructuring plan for its chemical industry.** Page 6

■ **Frank E. Young, departing FDA chief, urges more resources and staff, better facilities for embattled agency.** Page 6

Cover: Early 1860s portrait of man (perhaps the photographer) with view camera. Photo courtesy of the Smithsonian Institution

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Greater use of renewable energy sources is the solution to the global warming problem and needs new commitment from the government, a recent study concludes. Page 15

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Early efforts at photography led to a variety of images—daguerreotypes, calotypes, heliographs—using a wide range of chemical methods. Page 26

Chemical & Engineering News
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LETTERS

Tritium in cold fusion

SIR: I have read with interest the recent reports (C&EN, Nov. 6, page 32) of the finding of tritium in the cold fusion electrolysis of deuterium oxide using palladium electrodes. However, the reports indicate the sporadic, unpredictable nature of the findings. This may be due to the fact that the tritium is already present in the deuterium oxide in variable amounts before the electrolysis begins. Heavy water is prepared by concentrating deuterium atoms from normal water, and it would be expected that tritium would be concentrated at least as much, if not considerably more. Even though tritium is present in much lower concentrations than deuterium, the enrichment would tend to make it be present in high enough concentrations to be found by normal analytical techniques.

None of the news reports indicate whether the starting heavy water has been analyzed for tritium and whether that which has been found is the differential between starting and final amounts. This is certainly a necessary step before any conclusive claim can be made for the production of tritium in the electrolysis process.

Amos J. Leffler
Professor of Chemistry
Villanova University

Nuclear power and the press

SIR: Ivan Legg's letter (C&EN, Oct. 30, page 2) reminded me of an exchange I had with ABC News some years ago.

In the mid-1970s we were attempting to obtain an operating license for the Barnwell nuclear plant, so were heavily involved in safety analysis. One evening on the wrapup portion of ABC News, Harry Reasoner called his science editor Jules Bergman to the fore and said, "Jules, we have been hearing a lot about the safety of nuclear power plants. How many people would be killed in an accident, as many as a million?" Jules replied, "Oh no, Harry, only 100,000."

I wrote a letter to Reasoner quoting the Rasmussen report (Wash-1400, "The Safety of Nuclear Power Plants") wherein estimates in worst-case analyses were much lower than the figures they gave on television. I received a reply from Reasoner saying he had turned my letter over to his science editor. I shortly received a reply from Bergman, in which he admitted to have spoken hastily, and that estimates of fatalities were much lower than 100,000.

Did ABC News or Reasoner ever admit to this gross overestimate on television? Of course not! Subsequent events at Three Mile Island and Chernobyl have shown that estimates in Wash-1400 were too high.

The executive summary of Wash-1400 compares risk estimates of nuclear power with events we are exposed to in our daily lives, such as riding in automobiles and airplanes, and events of nature. One of the standing jokes at that time went like this: "Did you hear that Norm Rasmussen's house was struck by a meteor? Fortunately, Norm was not hurt. He was in the hospital recovering from lightning burns."

Wesley Murbach
Tucson

Solution to teacher shortage

SIR: This immodest proposal, set in the context of recent experiences with chemical science education in the state of Texas, is in response to recent articles in the *Journal of Chemical Education* [Hilderbrand, D. C., Jensen, W. P., "A Partial Solution to the High School Chemistry Shortage," **66**, 427, (1989); Sedotti, M., Tanaka, J., "Rules Minimize Student Interest in Chemistry," **66**, 497, (1989)] and in C&EN's annual salary surveys and articles on the career distribution of certified graduates.

We in science education have been aware of the catastrophic shortage of chemistry and physics teachers in our secondary schools for a number of years. Principals and science coordinators have felt this "crunch" and have been pressing governing bodies, like the Texas Education Agency, to relieve the certification pressures. Large school systems in highly industrialized cities have instituted alternate certification programs so that scientists can make a transition from industrial positions to secondary teaching jobs without significant course requirements. Some states,

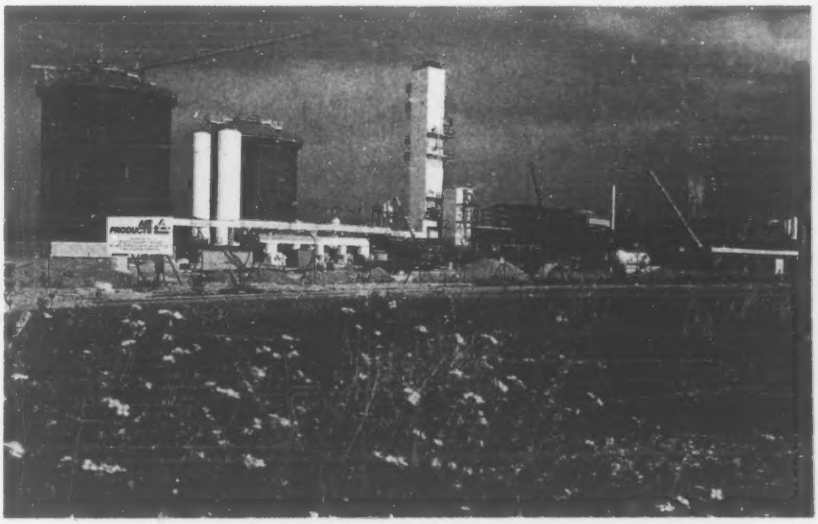
Correction

• Nov. 13, page 31: Panel discussion at Roosevelt University was moderated by David Slavsky, associate professor of natural sciences at Loyola University, Chicago, not Leonard Reiffel.

Chemical Capital Spending To Continue Steady Climb

Some forecasts seem overly ambitious, however, in view of weakening auto and housing sectors, lower plant capacity use, and slipping prices

Marc S. Reisch,
C&EN Northeast News Bureau



Air Products air separation plant under construction in France

Worldwide capital spending by U.S. chemical companies will increase modestly again in 1990, according to preliminary forecasts by leading chemical producers. However, only eight of the 12 major chemical producers that C&EN surveys every year at this time were able to forecast their 1990 expenditures. For those eight companies, 1990 capital spending will rise 12% from 1989 to a combined $4.74 billion. That forecast follows a somewhat lower 1989 increase of 10% for reporting firms.

Predictions of an economic downturn have caught a number of companies unaware. At this time in 1988, a stronger than expected economy caught companies off guard as well, and so only nine of the 12 companies in the survey were able to come up with capital spending predictions. When the same 12 companies were queried in early December of 1987, 11 of them were confident enough to predict their capital spending for the following year.

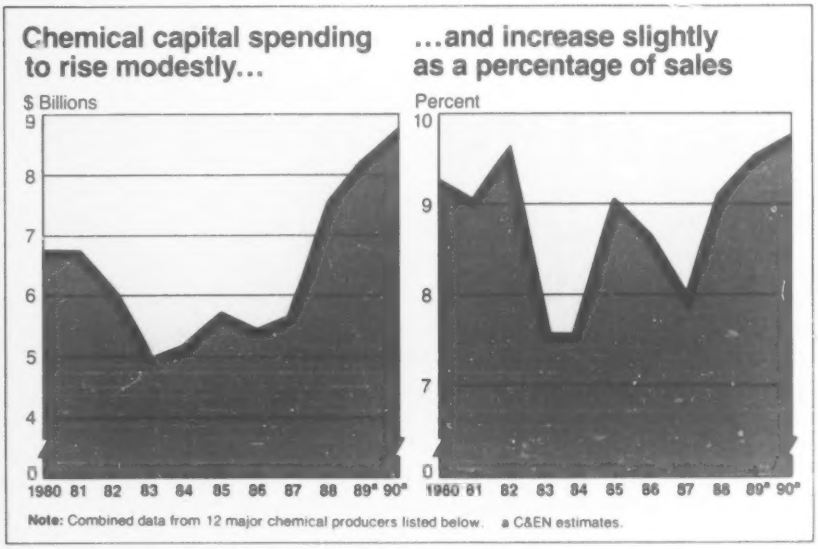
This year's survey lacks 1990 capital spending predictions from American Cyanamid, Du Pont, Monsanto, and Union Carbide. Together these four companies represented $3.66 billion in combined capital expenditures, or 49% of surveyed companies' spending in 1988. Du Pont alone represented 27% of 1988 spending for surveyed companies. In fairness to Du Pont though, it frequently misses the deadline for C&EN's survey because its board of directors meets so late in the month that its forecast cannot be included in this December survey. The 1990 forecast thus is based on Air Products, Dow Chemical, Ethyl, W. R. Grace, Hercules, Olin, PPG Industries, and Rohm & Haas.

However, some of the large capital spending increases recorded in this C&EN survey may not be good predictors for the industry. For instance, Ethyl forecasts a 118% increase in 1990 capital expenditures to $240 million compared with 1988, following a 27% drop in 1988 to $110 million compared with the previous year. However, an Ethyl spokesman explains that the 1990 and 1989 numbers have been adjusted to account for the July 1989 spin-off of Tredegar Industries. Earlier numbers are not adjusted.

Dow's 24% spending rise for 1990 to $2.1 billion compared with 1989 includes some ambitious spending plans for expansions in commodity chemicals, including a styrene plant in the U.S. and European expansions in ethylene, polyethylene, styrene, polycarbonates, isocyanates, and propylene oxide. These are ambitious given recently lower capacity utilization rates and a drop in chemical prices.

If the swings in the survey produced by Dow's and Ethyl's spending forecasts are excluded, combined expenditures planned by the six remaining companies—Air Products, W. R. Grace, Hercules, Olin, PPG Industries, and Rohm & Haas—show an average decline of 0.5%. This seems to indicate some caution in the chemical industry about the direction capital expenditures will take in 1990. Earnings in 1989 have already slowed compared with 1988. Sales were up only 3% in the third quarter of 1989 compared with the same quarter of 1988 and earnings were down 15% for the 30 major chemical companies C&EN tracks quarterly (C&EN, Nov. 13, page 8).

Given this indication of caution



Note: Combined data from 12 major chemical producers listed below. a C&EN estimates.

but also weighing in the backlog of projects to which many chemical companies are still committed, C&EN estimates that industry capital spending as a percentage of sales will be closer to 9.5% in 1989 than the 8.8% predicted in last year's survey. The 1990 figure may reach as high as 9.7%, a nine-year high, but only if spending levels remain at their present high levels.

According to a spokesman for the Houston Economic Development Council, spending in the center of the U.S. petrochemical industry remains strong. According to a survey taken by Houston Lighting & Power Co. in March, 149 projects valued at $5.5 billion are under way or scheduled in the Houston Gulf Coast region between 1989 and 1992. But it is reasonable to assume, says the spokesman, that some of those projects will be abandoned as the industry reaches overcapacity. The council, he says, does not expect to see as many projects under way in the next four years as there are currently. The only exception is Phillips 66's unanticipated capital expenditures to replace polyethylene capacity lost in the Oct. 23 explosion in Pasadena, Tex.

In fact the council is pushing to bring fabricators of end-use products into the Houston area to avail themselves of the enormous supply of raw materials available there, says the spokesman. Petrochemical producers may not be investing so heavily in their plants after 1992 if only because they will have state-of-the-art facilities in place then, says the spokesman.

Jane E. Belcher, an assistant vice president and chemical analyst with the investment research and credit rating firm of Duff & Phelps in Chicago, expects overall chemical industry capital spending to stabilize or perhaps increase "a little" in 1990 following the "significant" increase in 1989 spending. Some projects announced for ethylene expansions may have to be canceled as a result of the drop both in capacity utilization and prices, but Belcher believes the level of capital expenditures for 1990 will remain "healthy."

A healthy level of spending is justified because 1990 probably will bring only a slowdown and not a recession, says Belcher. As a result, chemical producers will be in a good position to take advantage of an upswing in the economy.

Du Pont chief economist Richard J. Stuckey says that capital spending for the chemical industry was up only 3% in constant dollars for 1989 compared with 1988. He predicts that there will be no growth in capital expenditures in 1990 for the industry. However, he notes that spending for 1988, 1989, and 1990 is at a level 60% above the second half of the 1970s in real dollars. The industry, therefore, is investing

Capital spending of surveyed companies will increase 12% next year

	1990		1989		Worldwide					Change from previous year	
$ Millions	Total	U.S.	Total	U.S.	1989 planned[a]	1988	1987	1986	1985	1990	1989
Air Products[b]	$ 600	$ 420	$ 562	$ 372	$ 550	$ 409	$ 323	$ 367	$ 392	6.8%	37.4%
American Cyanamid	na	na	400	na	350	374	268	263	203	na	7.0
Dow Chemical	2100	1155	1700	935	1650	1670	995	890	806	23.5	1.8
Du Pont[c]	na	na	na	na	na	2029	1674	1587	1515	na	na
Ethyl[d]	240	155	110	95	150	151	139	134	90	118.2	−27.2
W. R. Grace	550	na	475	na	475	418	243	199	348	15.8	13.6
Hercules	225	175	280	235	na	251	205	257	234	−19.6	11.6
Monsanto	na	na	600	450	na	590	505	520	645	na	1.7
Olin	175	na	130	na	130	147	115	128	154	34.6	−11.6
PPG Industries	450	280	575	435	500	410	426	356	452	−21.7	40.2
Rohm & Haas	395	292	385	280	350	338	222	179	159	2.6	13.9
Union Carbide	na	na	na	na	800	671	502	524	649	na	na
TOTAL	$4735	$2477	$5217	$2802	$4955	$7458	$5617	$5404	$5647		
ANNUAL CHANGE[e]	12%	5%	10%	24%		33%	4%	−4%	10%		

a Earliest estimate. b Fiscal year ends Sept. 30. c Excludes Conoco. d 1989 and 1990 figures adjusted to reflect spin-off of Tredegar Industries in July 1989. e Cumulative change for companies reporting. na = not available

West German chemical giants plan spending hikes

Arriving at a composite picture of capital expenditures for West Germany's three largest chemical companies—BASF, Bayer, and Hoechst—is as difficult as obtaining one for their U.S. counterparts. The three are in as much of a quandary about the direction of the economy in 1990 as many U.S. companies. Only one of the three, BASF, provided a projection for spending plans worldwide as well as for its U.S. operations during 1990. Hoechst could only provide 1990 data for its U.S. unit, and Bayer didn't provide any 1990 data at all.

BASF forecasts its total 1990 worldwide capital expenditures at $2.6 billion, a 12% increase over year-earlier spending levels (figures are based on a conversion rate of $1.00 = 1.8 deutsche marks for both 1989 and 1990). The company projects a spending increase at less than half the rate of its 21% increase in 1989, when it figures it spent $2.3 billion. Of the two companies that provided an estimate of 1989 capital spending, BASF and Bayer collectively hiked expenditures 13% in 1989 compared with their combined spending levels a year ago.

The West German chemical companies continue to spend a greater share of their overall budget in the U.S. for plant and equipment improvements than has been their practice in spending for their worldwide operations. Of the two who could estimate 1990 plans for U.S. spending, BASF and Hoechst planned a combined 32% increase in spending for 1990. Unlike their U.S. counterparts, these two companies are increasing the level of their investment by a considerable amount; the seven reporting U.S. companies are increasing their 1990 U.S. investments a combined 5%.

Again in 1990, the three West German companies differed from their U.S. competitors in their spending patterns in the U.S. The three boosted their spending in the U.S. only 14% in 1989. In contrast, the seven reporting U.S. companies in this year's survey say they increased their 1989 spending levels a collective 24%. Apparently U.S. chemical concerns spend more in a growing economy and less in a declining economy. In contrast, their West German competitors take greater risks in a downturn for long-term goals.

	1990		1989		Change from previous year	
$ Millions[a]	Total	U.S.	Total	U.S.	1990	1989
BASF	$2555	$ 650	$2277	$ 460	12.2%	21%
Bayer	na	na	1851	333	na	4
Hoechst	na	450	na	375	na	na
TOTAL	$2555	$1100	$4128	$1168		
ANNUAL CHANGE[b]	12%	32%	13%	14%		

a $1.00 = 1.8 deutsche marks. b Cumulative change for companies reporting. na = not available.

heavily in plant and equipment improvements at current levels, he points out. Spending may in fact have to drop soon, Stuckey believes, because if current spending levels persist, the industry would have a lot of excess capacity.

Stuckey agrees with Duff & Phelps' Belcher that the economy is heading for a soft landing rather than a recession. This bodes well for sustained capacity utilization rates. For one, interest rates have eased and the Federal Reserve System has increased available dollars in the marketplace since the summer, thus making it possible to finance current capital projects. And although the leading economic indicators slipped in October, they have not slipped to levels usually seen prior to a recession. Both employment and income continue to rise, he says. A bright note, too, is that consumer confidence is still high, meaning consumers don't intend to postpone personal consumption to an extent that would harm manufacturing and retail operations, with the exception of the automotive sector.

Housing, a large customer of the chemical industry, probably will not be a big plus for the chemical industry in 1990, but neither will it be a big minus, says Stuckey. Similar to last year, exports of U.S. chemicals will continue to grow in 1990, thereby bolstering industry capacity utilization. The dollar, he believes, is still low enough relative to European and Asia/Pacific currencies to warrant further export gains by U.S. chemical manufacturers.

Capital and equipment improvements this year have ostensibly put chemical companies in a good position to prosper should the economy experience that "soft landing" in 1990. Five of eight chemical producers who provided sufficient data for comparisons actually spent more in 1989 than they originally planned. PPG Industries increased its expenditures 40% to $575 million. That figure is $75 million more than it forecast in last year's survey and well ahead of the average of 10% for the group of companies reporting 1989 expenditure plans. Air Products increased 1989 spending 37% to $562 million, $12 million more than it planned originally. Rohm & Haas also boosted spending a considerable 14% in 1989 to $385 million, $15 million more than it had predicted.

American Cyanamid invested $400 million in capital projects in 1989, an increase of 7%—below the 10% average for the group, but $50 million more than it had planned. Dow boosted its 1989 spending level a mere 2% to $1.7 billion. Still that increase represented an increase of $50 million above its original figure.

Hercules did not provide an early 1989 spending prediction. Its most recent spending figure of $280 million for 1989, however, is some 12% above its year-earlier spending level and higher than the group average.

The U.S. seemed to benefit more from capital spending efforts in 1989 than reporting companies predicted in last year's survey. Responding companies increased 1989 U.S. spending levels an average 24%, reflecting stronger market conditions during the first part of 1989 than originally supposed. In last year's survey, reporting companies planned only a 12% increase in U.S. expenditures. □